

REMARKS

This communication is a full and timely response to the non-final Office Action dated October 26, 2004 (Paper No./Mail Date 101304), the period for response being extended through a Petition for Two-Month Extension of Time submitted herewith. By this communication, the title and claims 1-5 and 13-16 have been amended.

The title has been amended to name the invention "Semiconductor Device Structure that Prevents p-type Impurity Diffusion."

Claim 1 has been amended to recite wherein the high-dielectric constant film is selected from film comprised of enhanced dielectric materials including Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , silicate film derived from said enhanced dielectric materials, film having multi-element materials including a combination of at least two of Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , and film having multi-layered structures including at least two layers of said silicate film. Support for the subject matter recited in claim 1 can be found variously throughout the specification, for example, in paragraph [0026] of corresponding U.S. Patent Application Publication No. 2004-0164364. No new matter has been added.

Claims 2-5 and 14-16 have been amended to improve idiomatic English and form, where applicable. No new matter has been added.

Claim 13 has been amended to recite wherein the high-dielectric constant film is selected from film comprised of enhanced dielectric materials including Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , silicate film derived from said enhanced dielectric materials, film having multi-element materials including a combination of at least two of Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , and film having multi-layered structures including at least two layers of said silicate film. Support for the subject matter recited in claim 1 can be found variously throughout the specification, for example, in paragraph [0026] of corresponding U.S. Patent Application Publication No. 2004-0164364. No new matter has been added.

Claims 1-5 and 13-16 are pending where claims 1 and 13 are pending.

Objections to the Specification

The specification is objected to for allegedly having a title that is not descriptive of the invention. As discussed above, the title has been amended to name the invention "Semiconductor Device Structure that Prevents p-type Impurity Diffusion." Accordingly, Applicant respectfully requests that the objection to the specification be withdrawn.

Rejections Under 35 U.S.C. 102

Claims 1, 3, and 4 were rejected under 35 U.S.C. 102(e) as anticipated by *Rodder et al.*, U.S. Patent No. 6,251,761. Applicant respectfully traverses this rejection.

Claim 1 recites a semiconductor device comprising a semiconductor substrate; a high-dielectric-constant film on the semiconductor substrate; and a nitride layer on the high-dielectric-constant film, wherein the high-dielectric constant film is selected from film comprised of enhanced dielectric materials including Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , silicate film derived from said enhanced dielectric materials, film having multi-element materials including a combination of at least two of Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , and film having multi-layered structures including at least two layers of said silicate film.

Rodder discloses a transistor having an oxynitride layer 106 formed on a substrate 102. A high-K dielectric layer 108 is formed on the oxynitride layer 106. Layer 108 will typically comprise an oxygen-containing high-K dielectric material such as Ta_2O_5 , BaTiO_2 , TiO_2 , CeO_2 , or BST.

Rodder fails to disclose, teach, or suggest that the high-dielectric constant film is selected from film comprised of enhanced dielectric materials including Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , silicate film derived from said enhanced dielectric materials, film having multi-element materials including a combination of at least two of Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , and film having multi-layered structures including at least two layers of said silicate film. Thus, *Rodder* fails to anticipate claim 1.

To properly anticipate a claim, the document must disclose, explicitly or implicitly, each and every feature recited in the claim. See *Verdegall Bros. v. Union Oil Co. of Calif.*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). *Rodder* fails to disclose, teach, or suggest every element recited in independent claim 1, therefore this claim is not anticipated by *Rodder*. Accordingly, Applicant respectfully requests that the rejection of claim 1 under 35 U.S.C. §102 be withdrawn, and this claim be allowed.

Claims 3 and 4 depend from claim 1. By virtue of this dependency, Applicant submits that claims 3 and 4 are allowable for at least the same reasons given above with respect to claim 1. In addition, Applicant submits that claims 3 and 4 are further distinguished over *Rodder* by the additional elements recited therein, and particularly with respect to each claimed combination. Applicant respectfully requests, therefore, that the rejection of claims 3 and 4 under 35 U.S.C. §103 be withdrawn, and these claims be allowed.

Rejections Under 35 U.S.C. 103

Claims 2, 5, and 13-16 were rejected under 35 U.S.C. 103(a) as unpatentable over *Rodder* in view of *Ramkumar*, U.S. Patent No. 6,436,848. Applicant respectfully traverses this rejection.

Claim 13 recites a semiconductor device comprising a semiconductor substrate; a gate insulating film on the semiconductor substrate; and a gate electrode formed on the gate insulating film and including at least a p-type impurity-contained layer, wherein the gate insulating film includes a high-dielectric-constant film and a nitride layer on the high-dielectric-constant film, and wherein the high-dielectric constant film is selected from film comprised of enhanced dielectric materials including Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , silicate film derived from said enhanced dielectric materials, film having multi-element materials including a combination of at least two of Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , and film having multi-layered structures including at least two layers of said silicate film.

As discussed above, *Rodder* discloses a transistor having an oxynitride layer 106 formed on a substrate 102. A high-K dielectric layer 108 is formed on the oxynitride layer 106. Layer 108 will typically comprise an oxygen-containing high-K dielectric material such as Ta_2O_5 , BaTiO_2 , TiO_2 , CeO_2 , or BST. The Examiner acknowledges that *Rodder* fails to disclose, teach, or suggest at least a gate electrode include at least a p-type impurity. Applicant adds, however, that *Rodder* also fails to disclose, teach, or suggest at least the gate insulating film includes a high-dielectric-constant film and a nitride layer on the high-dielectric-constant film, and wherein the high-dielectric constant film is selected from film comprised of enhanced dielectric materials including Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , silicate film derived from said enhanced dielectric materials, film having multi-element materials including a combination of at least two of Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , and film having multi-layered structures including at least two layers of said silicate film, as recited in claim 13.

Ramkumar discloses a process for forming nitrogen-rich silicon oxide-based dielectric materials. In this process, an oxidizing apparatus is provided (step 200). Next, wafers are positioned in a processing chamber (step 220). An oxidizing atmosphere is directed to the wafers in the processing chamber so that a silicon oxide layer is formed on the wafer (step 240). At step 260, nitrous oxide is provided to a torch zone of the oxidizing apparatus to form a nitridizing atmosphere. Next, the nitridizing atmosphere formed in step 260 is directed from the torch chamber to the process chamber. *Ramkumar*, however, fails to disclose, teach, or suggest

at least the high-dielectric constant film is made of a material selected from a plurality of enhanced dielectric materials of films including Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , a plurality of silicate films of the enhanced dielectric material films, a plurality of films having multi-element materials including a combination of at least two of Al_2O_3 , ZrO_2 , HfO_2 , and PrO_2 , and a plurality of film having multi-layered structures of at least two layers of the enhanced dielectric materials of films. When using Al_2O_3 or HfO_2 as the dielectric constant film, for example, the thickness of the nitride film formed on the surface of the dielectric constant film cannot exceed 5\AA .

Therefore, because neither *Rodder* nor *Ramkumar* disclose a high dielectric film as recited in claim 13, the advantages of the instant invention cannot be realized.

In sum, *Rodder* and *Ramkumar* either singly or combined fail to disclose, teach, or suggest every element recited in claim 13. At best, the combination of *Rodder* and *Ramkumar* discloses a process for forming silicon oxide dielectric material where the high dielectric constant film made from Ta_2O_5 , BaTiO_3 , TiO_2 , CeO_2 or BST and materials other than those recited in claim 13. Therefore, a *prima facie* case of obviousness has not been established.

To establish *prima facie* obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Moreover, obviousness "cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination." *ACS Hosp. Sys. V. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). For at least these reasons, Applicant respectfully requests that the rejection of claim 13 under 35 U.S.C. 103 be withdrawn and this claim be allowed.

Claims 2 and 5 depend from claim 1, and claims 14-16 depend from claim 13. By virtue of this dependency, Applicants submit that claims 2, 5, and 14-16 are allowable for at least the same reasons given above with regard to their respective base claims. In addition, Applicants submit that claims 2, 5, and 14-16 are further distinguished over *Rodder* and *Ramkumar* by the additional elements recited therein, and particularly with respect to each claimed combination. Applicant respectfully requests, therefore, that the rejection of claims 2, 5, and 14-16 under 35 U.S.C. §103 be withdrawn, and these claims be allowed.

Conclusion

Based on at least the foregoing amendments and remarks, Applicants submit that claims 1-6 and 13-16 are allowable, and this application is in condition for allowance. Accordingly, Applicants request favorable reexamination and reconsideration of the application. In the event the Examiner has any comments or suggestions for placing the application in even better form, Applicants request that the Examiner contact the undersigned attorney at the number listed below.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 18-0013, under Order No. SON-2612/DIV from which the undersigned is authorized to draw.

Dated: March 28, 2005

Respectfully submitted,

By

Ronald P. Kananen

Registration No.: 24,104

Attorney for Applicant

RADER, FISHMAN & GRAUER, PLLC

Lion Building

1233 20th Street, N.W., Suite 501

Washington, D.C. 20036

Tel: (202) 955-3750

Fax: (202) 955-3751

Customer No. 23353

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